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EFFICIENT USE OF AGRICULTURAL LAND IN THE CURRENT CONTEXT OF CLIMATE CHANGE

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Abstract: The paper refers to the soils in Giarmata town, Timiș county, the occupied surfaces and the way of use, presenting the main limiting factors and the classification in quality and fertility classes of the main agricultural crops in the current context of climate change.

The targeted objectives refer to: the description and presentation of the pedological and climatic conditions of the area; the presentation of the main types of soil in the Giamata area and the description of those studied; listing the main quality classes, respectively fertility; establishing the limiting factors and describing the processes taking place; description of the types of soil on which the research was carried out; classifying land into quality classes according to the credit ratings obtained for the main agricultural crops (corn, wheat, barley and sunflower) in the period 2021-2022. The studied material refers to the identification, presentation and description of the main types of soils identified in this area, namely: preluvosols, alluviosols, chernozioms, vertosols, pelosols, gleosols and stagnosols.

Giarmata commune is located in the central-northern part of Timiș county, at a distance of 11 km from Timișoara municipality and 1.3 km from Timișoara International Airport. The town is located at an altitude between 100 and 150 m, with little fragmentation and low relief energy, occupying a total area of 7150 ha, of which 6292 ha is agricultural land and 43.5 ha forest. The studies were carried out on 158 ha, divided into 5 plots, with areas between 22 and 43 ha. The main crops were maize (83 ha), wheat (44 ha), sunflower (20 ha) and barley (8 ha).

• Introduction

Dealing with the study of soil, as a living environment for plants, pedology has a very important role in the development of agricultural production. The process of obtaining agricultural products is directly related to the soil, which in agriculture is the main means of production (POSEA GH., 2009; ȚĂRAU D., BORZA I., DUMITRU M., CIOBANU C., 2007).

The soil, as a means of production in agriculture, presents certain particularities, which distinguish it from other means of production. Thus, soil is a natural means of production, which forms and evolves on the surface of the land, over time and under the influence of environmental conditions (BUCUR N., LIXANDRU GH., 1997). Also, unlike other means of production that wear out through use, the soil, if used rationally, not only does not decrease its fertility, but, on the contrary, can increase it (GOIAN M., IANOS GH., RUSU I., 1983; URUIOC STELA.2001).

Agricultural practice shows that, indeed, production capacity and therefore yields can be increased with the help of certain measures, such as: the use of advanced high-tech machinery and tools; use of fertilizers, amendments and control substances; by carrying out works of irrigation, drying, drainage, damming, preventing and combating erosion; by improving man's work and knowledge; by applying research results in scientific research, etc. (BRADY N.C., WEIL R.R., 2003).

The results of research in the field of soil science provide in decades, especially many, very important for the improvement of the latest technologies and plant cultivation, and aim at the direction of the plant nutrition process, the control of the state of fertility and pollution. , through the physico-chemical analysis of the soil and the plant, etc.(MIRCOV, V.D., OKROS, A., MIHUȚ, C., BORCEAN, A., 2019).

• Material and method

The paper presents the soils in Giarmata town, Timiș county, the occupied surfaces and their use, the main limiting factors and the quality and fertility classification of the main agricultural crops in the current context of climate change (MIRCOV, V.D., OKROS, A., MIHUȚ, C., BORCEAN, A., 2019).

Proposed objectives: description of the pedological and climatic conditions of the area; the presentation of the natural setting of Giarmata commune; the presentation of the main types of soil in the Giamata area and the description of those studied; the presentation of the climatic conditions of the analyzed period (2021-2022) and the crop situation; enumeration of the main quality classes, i.e. fertility, in which the lands of the locality are classified in general; establishing the limiting factors and describing the processes taking place; the description of the types of soil on which the research was carried out and the classification of the land into quality classes according to the credit ratings obtained for the main agricultural crops (corn, wheat, barley and sunflower) in the period 2021-2022 (MIHUȚ CASIANA, LAȚO I., 2007; OBREJANU GR. ȘERBĂNESCU I., CANARACHE A., MANUCA O., 1964).

The studied material is represented by the identification, presentation and description of the main types of soils identified in this area, namely: preluvosols, alluviosols, chernozioms, vertosols, pelosols, gleosols and stagnosols (FLOREA N., 1964; FLOREA N., MUNTEANU I., 2012; IANOS GH., GOIAN M., 1995).

□ Conclusions:

The studied commune is located in the central-northern area of Timiș county, at a distance of only 11 km from the Municipality of Timișoara and 1.3 km from the "Traian Vuia" International Airport in Timișoara. This locality covers an area of approx. 7,150 ha, of which 6,292 ha is agricultural land, and 43.5 ha forest. The studies were carried out on the surface of 158 ha, divided into 5 plots, with surfaces between 22 and 43 ha.

The main crops were corn (83 ha), wheat (44 ha), sunflower (20 ha) and barley (8 ha).

From a geomorphological point of view, the area of the commune falls within the Banato-Crișană Plain, part of the Western Plain of Romania, the eastern extremity of the Tisa Plain.

To characterize the climate conditions, the climatic data recorded and interpreted by the discipline of Agrometeorology and Climatology, within the Faculty of Agriculture, were used.

The climate is moderately temperate-continental with warm summers and mild winters due to both the influences of oceanic (from the west) and Mediterranean (from the S and SW) air masses.

The thermal characteristics of the hot season highlight the early onset and persistence of the western anticyclone, which makes the summer season start from May and continue until September. Periods of unstable weather are caused by the intermittent superimposition of colder northwesterly air masses over warm subtropical air masses. Multiannual average summer temperatures frequently exceed 20°C.

The date of the first frost recorded during this period was on October 23, 2021. The date of the last frost was on May 12, 2021.

The sum of the temperature degrees during the researched period was: 12.9°C in the year 2022 and 12.4°C in the year 2021, something that shows a slight warming, a fact that is also reflected on the soils and crop plants.

The multi-year average of temperatures during 2021-2022 was 132.05°C.

Regarding the amount of precipitation, the annual average was 649 l/m², but it was unevenly distributed.

The predominant air movement is from west to east. Winds blow from the north at a rate of 15.7%, from the east around 15.6%, and from the south with a frequency of 20.6%.

The wind intensity is low, and the monthly average, according to the Beaufort scale, is 2.5 m/second.

The annual average number of days with speeds greater than 11 m/s was 26.8, and with speeds greater than 16 m/s was 2.6. The calm period occupies about 20.9% of the time.

As for the soil cover, it is represented by preluvosols, alluviosols, chernozioms, vertosols, pelosols, gleosols and stagnosols, representative as the surface being preluvosols and gleic vertosols

• Results and discussions

Located in the central-northern area of Timiș county (45°83' north latitude and 21°32' east longitude), the town of Giarmata, has been attested since 1332 and is located at a distance of 11 km from the municipality of Timișoara and 1, 3 km from the "Traian Vuia" International Airport in Timisoara. It occupies an area of 7150 ha, of which 6292 ha is agricultural land, and 43.5 ha is forest. The localities of Giarmata and Cerneteaz are part of this administrative territory. Giarmata commune is located on the southeastern end of the Vinga plain, with a general northeast to southwest orientation. The Vinga Plain has average altitudes between 100 and 150 m, very wide interfluvies, sprinkled with depression areas, a weak fragmentation and less relief energy (MUNTEANU I., FLOREA N., 2009).

According to geotechnical studies in the area, the soil stratifications are as follows:

- topsoil (0.2 - 0.8 m), local in the perimeter of the town of 2.1 m;

- loamy soils that include clays, dusty clays, clayey dusts, eddy-hard, wet and very wet pastes.

An important characteristic is the contraction of the clay soil, specific in areas of high amplitude, depending on the degree of humidity, recommending that the minimum foundation depth be at least 2 m, and the allowed pressure of 2 - 2.5 Kgf/cm².

In terms of climate, the studied territory is characterized by a moderate temperate continental climate, with shorter and milder winters, frequently being under the influence of cyclones and air masses from the Mediterranean Sea and the Adriatic Sea. Its general features are marked by the diversity and irregularity of atmospheric processes. Frequently, even in winter, moist air masses appear, bringing insignificant rains and snows, rarely cold waves.

The entire area falls within a multi-year average of 10.2°C.

The multiannual average temperature values, in the 5-10 cm layer, are higher by 2-4°C, compared to those in the air.

The main characteristic of the thermal regime in the studied area is due to the dominant influence of the circulation of western air masses, as can be seen from the data presented in the figure 1.

The lowest average temperature was recorded in February, 2021, namely -2.0°C. The absolute minimum temperature during the same period was -27.2°C on 16 February 2021. The average winter maximum temperature was 17°C and the summer minimum minimum temperature was 9°C.

The date of the first frost was on October 23, 2021. The date of the last frost was on May 12, 2021. The sum of the temperature degrees during the researched period was: 129°C in 2022 and 135.1°C in 2021.

The multi-year average of temperatures during 2021-2022 was 132.05°C. The duration of sunshine during the two years of study and figure 2.

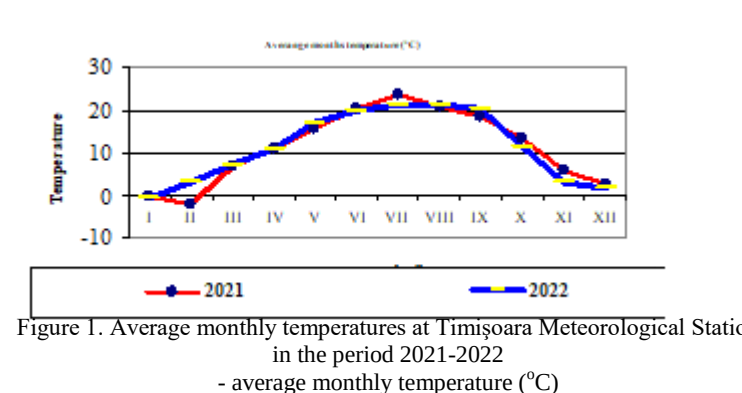


Figure 1. Average monthly temperatures at Timisoara Meteorological Station in the period 2021-2022

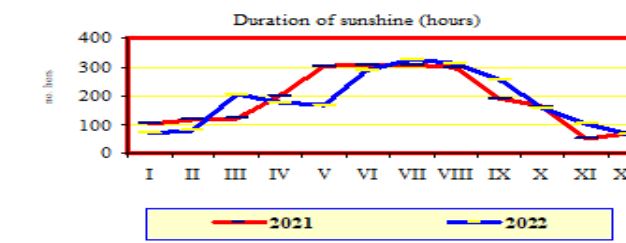


Figure 2. Sunshine duration (hours)

3. Precipitation regime

Regarding the precipitation regime, they have an annual average of 649 l/m². However, the distribution of precipitation is uneven between the two seasons. The average annual precipitation recorded in the period 2021-2022 was 630.6 mm (figure 3).

The lowest precipitation was in January 2021, respectively 18.1 mm, and the maximum monthly precipitation was in August, 81.4 mm.

The total amount of precipitation for the period 2021 - 2022 was 502.0 mm in 2021, and 785.2 mm in 2022, with a multi-year average of 643.6 mm.

Regarding the relative humidity of the air, it is evident that during the summer there is a humidity deficit, which needs to be reduced by appropriate agrotechnical measures or supplemented by irrigation (table and figure 4).

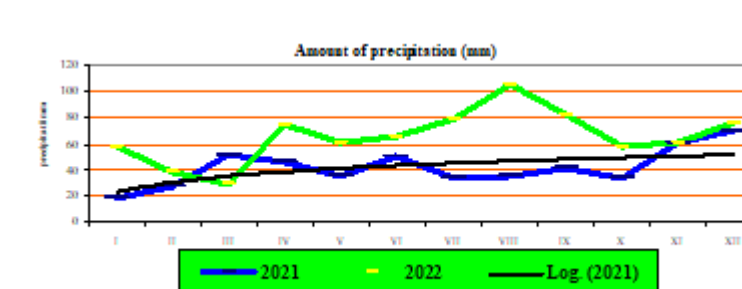


Figure 3. Monthly values of atmospheric precipitation in the period 2021-2022 (mm)

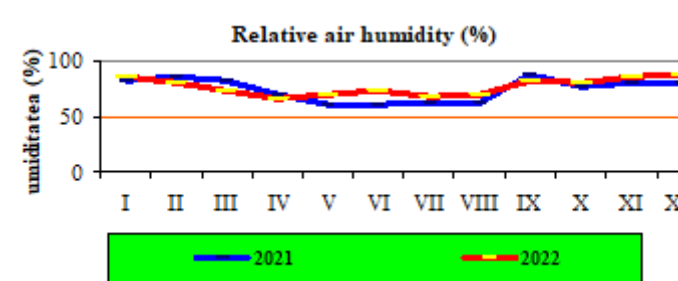


Figure 4. Relative air humidity (%)